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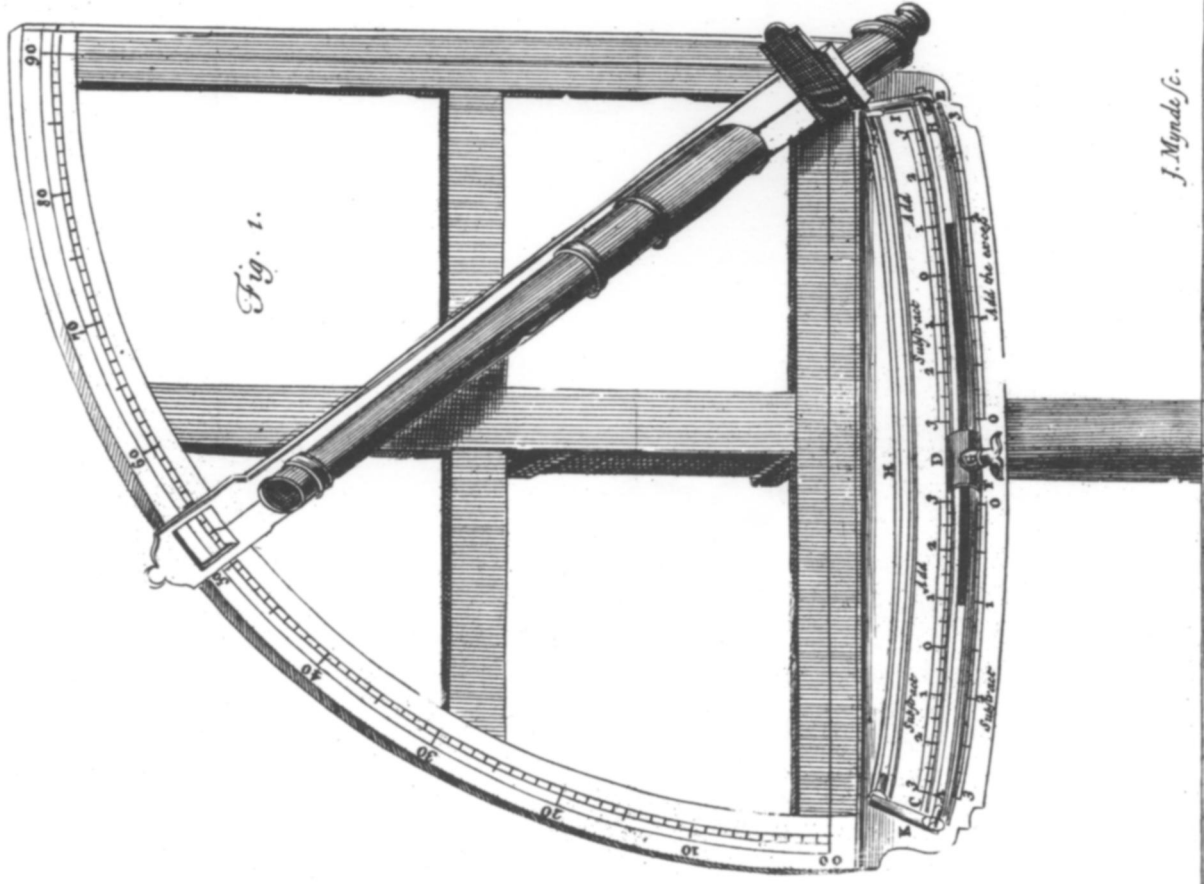
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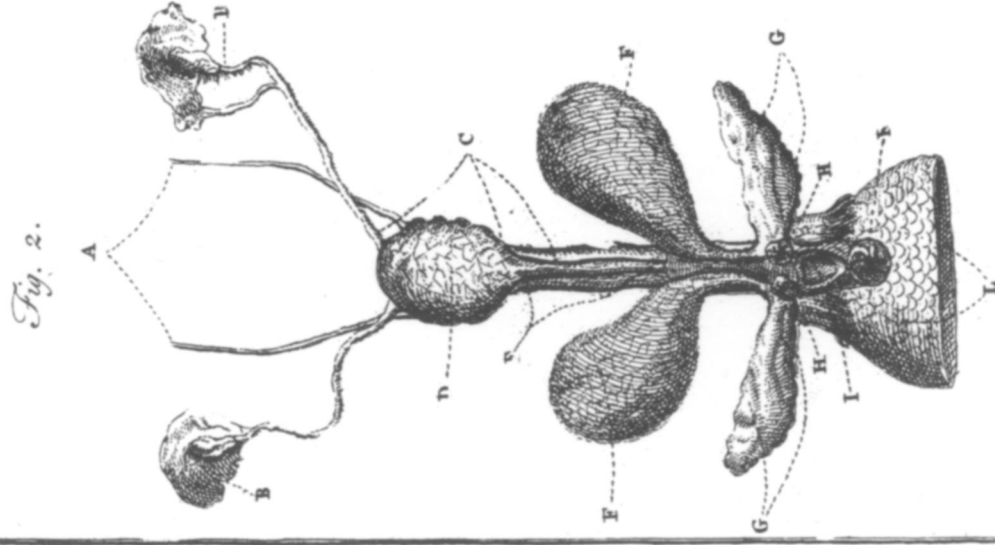
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J. Mynde Sc.



C. M. ad nat. delin.

dem ex metallis ; de actione ejus in metalla ; de metallis ipsis ; quæ in adversaria redegi. Otium nactus forte evulgabo : ut moniti parcant vano labori, & fuintibus. Valete !

II. *A Spirit Level to be fixed to a Quadrant for taking a Meridional Altitude at Sea, when the Horizon is not visible.* By John Hadley, Esq; V. Pr. R. S.

THE Necessity of seeing the Horizon, in order to find the Latitude of a Ship at Sea, has always been so great an Inconvenience, that any Method for determining it without the Help of the Horizon, will be of considerable Use, although it should be liable to an Error of a few Minutes : And as it is generally agreed by Seamen, that they are much oftner sensible of this Inconvenience in calm Weather, than in rough ; it is hoped that the following manner of constructing and using a Spirit Level, may, in that Case, be capable of so much Exactness, at least, as may render it acceptable to the Publick. *Vide Fig. 1.*

This Level is composed of a Glass Tube AB, bent into an Arch of a Circle, and containing such Number of Degrees as will be most suitable to the Degree of Exactness with which the Observation can be made. The Bore of it must not be wider than one Tenth of an Inch in Diameter, that the Liquor

in

in it may the better keep together, and the two Ends of it stand Perpendicular to the Tube in all Postures: Nor should it be much less, least the hanging of the Spirit to the Sides hinder it from settling so truly by its Weight to the lowest Part of the Tube. This Tube is cemented into another Brass one C D E F, of the same Curvature, the outer Half of which is taken off, so as to shew the Glass, leaving only a small Part in the Middle D F entire, in which a small Stop-cock G is placed. The Glass Tube is divided in two in the Middle to make room for this Stop-cock, the Key of which must be pierced through with a Hole of only about one hundredth Part of an Inch, for the Passage of the Liquor. The outer Ends of the Glass Tube must have a Communication with one another round about by Means of two small Pipes I and K, and the Tube H, the manner of which is sufficiently shewn by the Figure.

Each half of the Glass Tube A B must have a Scale of Degrees answering the Curvature of the Tube, subdivided at Pleasure. They may be number'd either as the upper or under Scale in the Figure; and observe that in the under Scale two Degrees are number'd as one; the Reason of which is, that the Motion of the Spirit in the Tube encreasing the Number on one Hand, and at the same time as much diminishing that on the other, their Difference is alter'd thereby, so as to answer to double that Motion. The Division of the Scales are cut on the Edge of the Brass half Tube, or Trough, which is made thick for the greater Strength.

In one of the small Pipes I or K, just against the Return of it, which enters the End of the first-mentioned Glass Tube at A or B, is a small Hole, by which to introduce into it so much Spirit of Wine as may fill it from the Middle of the Scale on one Hand to the Middle of that on the other ; this Hole may be afterwards stopped by a Skrew-pin.

The inner Ends of the two Halves of the Glass Tube A B should be fixed into the entire Part of the Brass Tube D F with a Cement made with old hard Bees-Wax, or some other Materials not dissolvable by Spirit of Wine, as should also the Ends of the small Pipes I and K into this and the Tube H : Those Halves, as to the remaining Part of their Lengths, may be fastned down with any strong Cement.

This Level may be set on to one of the Limbs of the Quadrant, fitted up for this Purpose, in the manner express'd in the Figure. It hath an Index moveable on the Center, and a Spring at the other End to keep it steady, when it is directed to any of the Divisions on the Arch, which needs no other Division than into whole Degrees. The Index may be furnished either with plain Sights, or may carry a short Telescope, with a Vane in its Focus, to receive the Image of the Sun, when it is bright enough ; but if the Sun be hazy, or the Moon, or a Star be observed, a sliding Shutter may be drawn out to transmit the Rays of Light to the Eye-glass. The Vane has also a Thread fix'd on it perpendicular to the Plane of the Quadrant. The whole Instrument (for the easier managing it) may be supported by a Staff, resting with one End on the Floor.

The manner of using it is thus: Holding the Quadrant in a vertical Posture, with that Limb to which the Level is fixed parallel to the Horizon, raise the Index to some Division of the Arch, as near as you can to the true Height of the Object; which is supposed to be near the Meridian, and consequently to alter its Altitude but slowly: Then turning the Key of the Stop-cock, so as to let the Spirit of Wine pass through the small Hole in it, keep the Image of the Object as close to the Thread on the Vane as you can, endeavouring that the unavoidable Vibrations of it above and below the Thread, may be equal, both in respect of their Length, and the Swiftnes of their Motions, &c. Continue this 'till the Spirit seems quite settled to some Part of the Scale, and something longer. This it will do slowly, but without any sensible Vibrations; for the Stop-cock allowing it no Passage but through the small Hole in its Key, will give such a Check to its Motions, as not only to stop those Vibrations, but also to hinder its being thrown backwards and forwards in the Tube by any Shocks of the Instrument; and yet as far as I have observed will not prevent its settling (with sufficient Truth, though slowly) to the lowest Part of the Tube. About half a Minute of Time or more may be necessary for this, according as the aforesaid small Hole is greater, or less in Proportion to the Bore of the Tube. When you judge the Spirit quite settled, turn the Stop-cock again: It is of no Importance that the Image of the Object be exactly on the Thread at the Instant that this is done. Observe against what Degree, and Part of a Degree, each End of the Spirit in the Tube stands. If your Scale be number'd like the upper one in the Figure, and the Quantity of Spirit be exact, both
Ends

Ends will agree, and the Degree and Parts marked must be added to, or subtracted from the Altitude shewn by the Index, according to the Directions: If the Ends do not exactly agree, take the Mean between them. If you use the under Scale, subtract the less Number from the greater, and add, or subtract the Excess, the Number resulting will shew the mean Elevation of the Index during the latter Part of the Observation, and will differ from the true Altitude of the Object about half so much as the Vibrations of its Image above and below the aforementioned Thread on the Vane fail of compensating one another during that time. If either End of the Spirit leave the Scale, the Index must be remov'd three or four Degrees, and the Observation repeated.

Instead of the Curve Tubes A and B, two strait ones might be used, set together so as to make a very obtuse Angle in the Middle; but then it will be convenient to have the Quantity of Spirit more exactly fitted to the Scale, because the allowing for the Difference will be something more troublesome.

If the Observer have an Assistant to attend to the Level, while he himself observes the Object, the whole Apparatus of the Brass Tube, and Stop-cock, may be omitted, substituting in its room only a Plug with a small Hole in it, which may be wrapped round with a very thin Slice of Cork, and so thrust down into the middle of the Glass Tube. The cutting the Glass Tube in half in the Middle may likewise be avoided, if, instead of the Stop-cock at G, there be one fixed in one or both of the Pipes I and K, to open and stop the Passage of the Air, having a larger Hole in their Keys, there being also a Plug with a small Hole, thrust down into the Middle of the Tube, as before.

The Bore of the small Pipes I and K, and the Tube H, must not be so narrow as to make it difficult to reduce the Spirit into its Place, if by any Accident either End of it should get into them.

I have been informed, that an Object may be kept in View without much Difficulty, even in pretty rough Weather, thro' a Telescope magnifying about ten times. Now as such Telescopes seldom comprehend an Area of much more than one Degree in Diameter, or at most 1 Deg. 20 Min. it follows that the Axis of the Telescope is always kept within 40 Min. at most of the Object, and that is the greatest Vibration of the Image above and below the Thread on the Vane. If this be allowed, it seems reasonable to expect that the Medium of the Vibrations one Way should not exceed the Medium of those the other, more than by about one fifth or one sixth Part of the greatest Vibration; *i.e.* about 7 or 8 Min. the half of which will be the Error of the Observation. In still Weather it will probably be much less, if the Instrument be in the Hands of a Person moderately skilful in observing.

III. *The Anatomy of a Female Beaver, and an Account of Castor found in her.* By C. Mortimer, M. D. R. S. Secret.

IN the *Acta Erudit. Mensæ Aug.* 1684, pag. 360, & *seq.* I find the Account of the Dissection of a Male and Female *Beaver* by E. G. H. who mistakes, in opening the Male, the Receptacles of the *Castor* for the *Uterus*, and the two *Glands* below them for *Dugs*;